

# Milestone 1

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<https://yobad.github.io/AppDevIII2024/project/milestone1>

## Team Contract

<https://github.com/JAC-Final-Project-W24-6A6-6P3/final-project-the-goons/blob/main/TeamContractTemplate.md>

## Design Document

## Functional Overview

The application allows remote control and monitoring of container farms with the use of an application. Owners of the containers can receive whereabouts and security updates, and farm technicians can adjust growing conditions to their liking, and receive real time information of the environment data. In order to secure and ensure effective

supervision of the farming container, the app will be able to display data, track history and configure notifications.

## Design overview

### **Login & Sign Up**

Users can access the application through the login and sign up screen. We will allow users to create accounts which they can then use to safely login.

### **Dashboard**

Users can obtain a detailed overview of the activities and status of the container farm on the dashboard. Important data such as water levels, humidity, temperature, and security status will be displayed. From this page, users can select a specific statistic to have an enlarged view of it on the screen, or simply view them grouped together as a whole.

### **Environmental Control Screen:**

Users can keep tabs on the environmental conditions within the container using this screen in real time. We will add buttons and sliders to manually change properties such as light or fan speed along with other properties that are responsible for maintaining the container environment.

## **Location Tracking Screen**

Users can monitor the position and location of their containers with the help of the location tracking screen. Using a GPS system, we will mark pins on a map to allow users to keep an eye on the geographical data of their containers and ensure they are set up and used properly.

## **Security Alerts**

We want users to receive notifications and alerts in case of security problems with containers. We will simply provide a catalog or list of recent security concerns to provide the user with an organized view of potential risks such as breaches or entries from unknown sources.

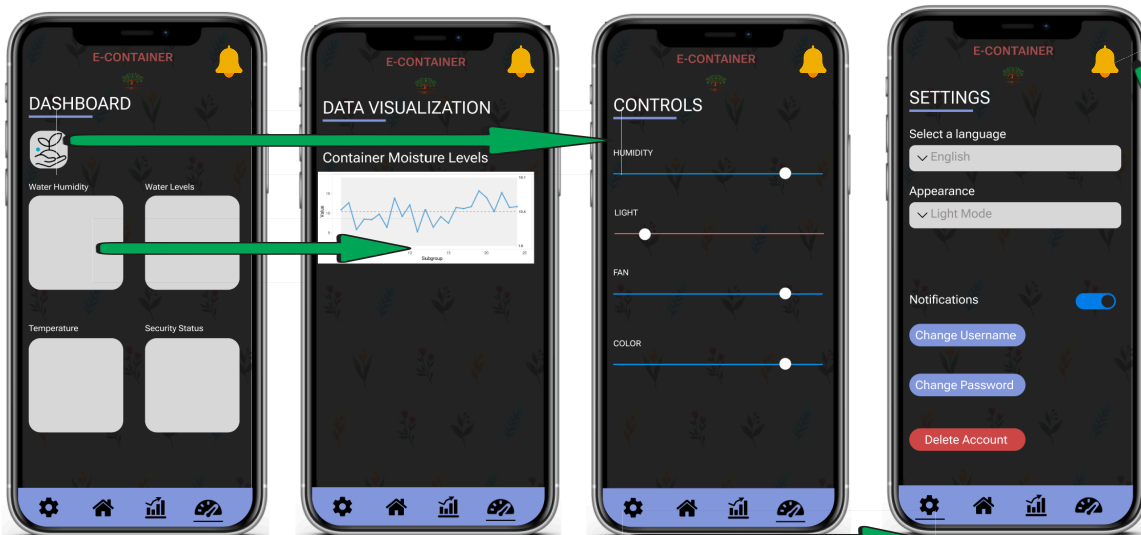
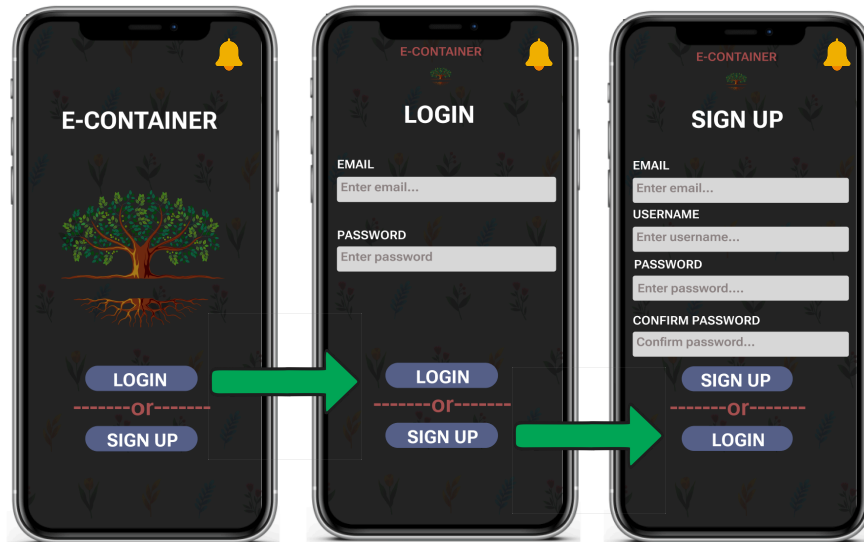
## **Settings Screen**

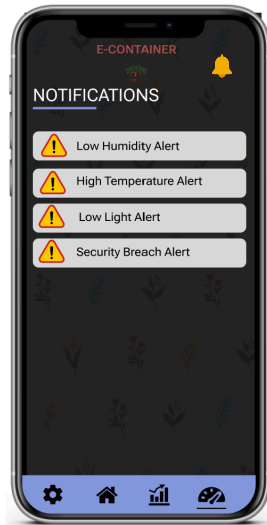
Users can adjust the app's settings and preferences to suit their personal style via the settings screen. We'd like to add settings such as light and dark mode and perhaps language change to maximize accessibility.

## **Data Visualization**

Users should also be able to see graphs noting historical changes daily, weekly, or monthly.. It shows graphs that show how environmental factors and other pertinent data change over time. Users can analyze trends, identify patterns, and make informed decisions based on historical data visualization.

# App Prototype





## App Features

Based on the needs provided and discussions with our team and the instructions provided, we have identified the following features our app aims to achieve, organized into epic user stories and further broken down into smaller, testable user stories:

### Epic 1: Environmental Monitoring and Control for Farm Technicians

**User Story:** As a farm technician, I want to view the current temperature inside the container on my app, so I can ensure it's within the optimal range for plant growth.

- **Acceptance Criteria:** Display real-time temperature data from the AHT20 sensor.

**User Story:** As a farm technician, I want to adjust the humidity level via the app, so that I can maintain the ideal growing conditions for the crops.

- **Acceptance Criteria:** Control the humidifier/dehumidifier settings through the app based on humidity data from the AHT20 sensor.

**User Story:** As a farm technician, I need to monitor water levels in the container's irrigation system to prevent plant dehydration.

- **Acceptance Criteria:** Real-time water level alerts from the Water Level Sensor when levels drop below a certain threshold.

**User Story:** As a farm technician, I want to control the lighting schedule and intensity through the app to optimize plant growth.

- **Acceptance Criteria:** Adjust lighting settings via the app, using data from an RGB Led Stick for light intensity.

## **Epic 2: Access and Operational Control for Farm Technicians**

**User Story:** As a farm technician, I need to remotely unlock the container door for easy access when my hands are full.

- **Acceptance Criteria:** Remote door unlock feature through the app, interfacing with a servo-controlled lock.

**User Story:** As a farm technician, I want to set automated climate control schedules to maintain optimal conditions without constant manual adjustments.

- **Acceptance Criteria:** Ability to create and edit climate control schedules in the app, automating the adjustment of fans and lights based on predefined settings.

## **Epic 3: Container Tracking and Management for Fleet**

### **Owners**

**User Story:** As a fleet owner, I want to view the live location of all container farms on a map to ensure they are correctly positioned.

- **Acceptance Criteria:** GPS data from the Air530 module displayed on an interactive map within the app.

**User Story:** As a fleet owner, I need to know immediately if a container isn't sitting right, to catch any setup problems early. Alerts will come in real-time if the container tilts too much, based on data from the reTerminal's built-in accelerometer.

- **Acceptance Criteria:** Real-time alerts for abnormal positioning and angles the container may be on



## Epic 4: Security and Alert System for Fleet Owners

**User Story:** As a fleet owner, I want to be notified of unauthorized movements or vibrations indicating potential tampering with the containers.

- **Acceptance Criteria:** Instant alerts when vibration levels detected by the reTerminal's built-in accelerometer exceed normal ranges.

**User Story:** As a fleet owner, I need to be alerted to unauthorized access attempts to take immediate action and ensure the security of the container farms.

- **Acceptance Criteria:** Real-time notifications when the PIR Motion Sensor detects unexpected movement during off-hours.

## Prioritization of Features

Must Develop

- **Features 1, 2, 3 (Epic 1):** These are essential for real-time environmental monitoring and control, directly impacting plant health and growth within the container farms.
- **Feature 5 (Epic 2):** Remote access control is crucial for farm technicians to efficiently manage and access the containers, ensuring smooth operational workflows.

- **Features 7, 9 (Epic 3 & 4):** Location tracking and unauthorized movement alerts are fundamental for fleet owners to secure and manage the container farms effectively.

#### Would Like to Develop

- **Feature 4 (Epic 1):** Adjusting lighting through the app is important for optimizing plant growth conditions and can significantly benefit farm operations, though it's less critical than temperature, humidity, and water level controls.
- **Feature 8 (Epic 3):** Monitoring container orientation can aid in maintaining proper installation and operation, enhancing overall management for fleet owners.
- **Feature 10 (Epic 4):** Unauthorized access alerts add an extra layer of security, making it a valuable feature for protecting the containers.

#### Could Develop if Time Permits:

- **Feature 6 (Epic 2):** Automated climate control schedules would increase convenience and efficiency for farm technicians, but the system can initially be managed with manual controls.

## Potential Showstoppers and Open Questions

- **Hardware and Software Integration:** Ensuring a smooth integration between the mobile app and the diverse range of sensors and actuators within the container farms could be an issue. Real-time data monitoring and environmental control require frequent communication between the components and the app.

- **Location Tracking and Security:** The GPS-based location tracking must be accurate and secure, as it's important for fleet owners to monitor the location and ensure the safety of their container environment (internal and external). Achieving a strong level of precision and security may pose a challenge, especially in the diverse environments the container may be in.
- **User Authentication and Access Control:** Providing secure access to the app for farm technicians and fleet owners, while preventing unauthorized access, is critical. The system needs a reliable user authentication that confirms the users true identity. To tackle this issue we are looking at the adoption of 2FA which may be a challenge.
- **Scalability and Performance:** As the number of users and container farms increases, the system must scale efficiently without compromising performance. Handling large volumes of real-time data from multiple sensors across numerous container farms poses a significant technical challenge.
- **User Interface and Experience:** Designing a creative and user-friendly interface that caters to the many needs of farm technicians and fleet owners, accommodating various technical tools is important for the effectiveness of the

app. Ensuring our app is not an eye sore might be a creative issue some of us are guilty of.

- **Network Reliability and Data Synchronization:** Given that containers will be remote, the system must handle network interruptions gracefully, ensuring that data is not lost and that operations can continue smoothly during offline periods. Because of potential network interruptions we will need to adopt a safe and effective communication protocol that can handle packet loss.